

Downscaled Climate Projections for California

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Climate Central, Inc.

Fish and Game Workshop
November 3, 2010

“Drink Responsibly”



CLIMATE CENTRAL

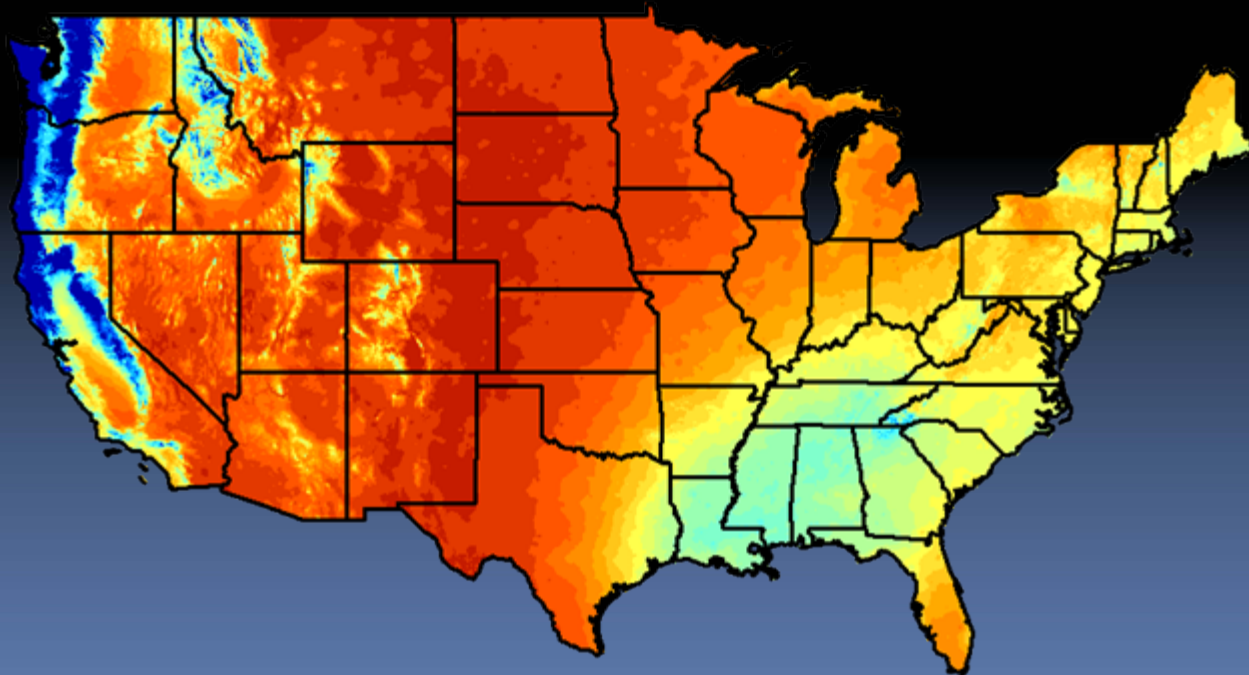
- 501(c)3 non-profit
- Offices in Princeton, N.J. and Palo Alto, CA
- Our mission: improve understanding of climate change on the part of the public and stakeholders

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Outline

- Datasets of downscaled climate projections
 - Dynamical
 - Statistical
- New Ideas



Which datasets will I discuss?

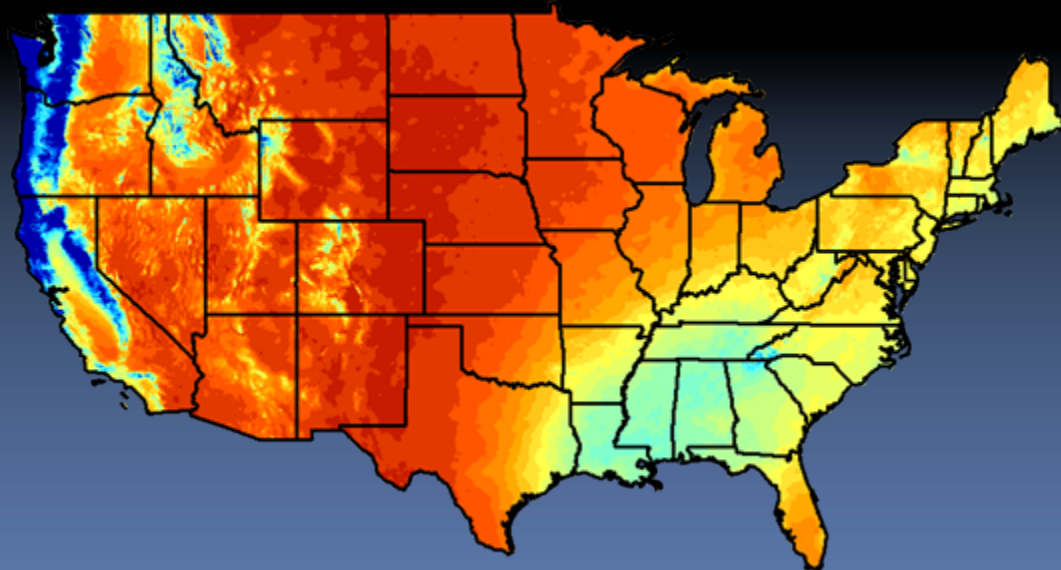
Ad hoc criteria for inclusion:

(1) Large ensemble of simulations

=> usually many GCMs

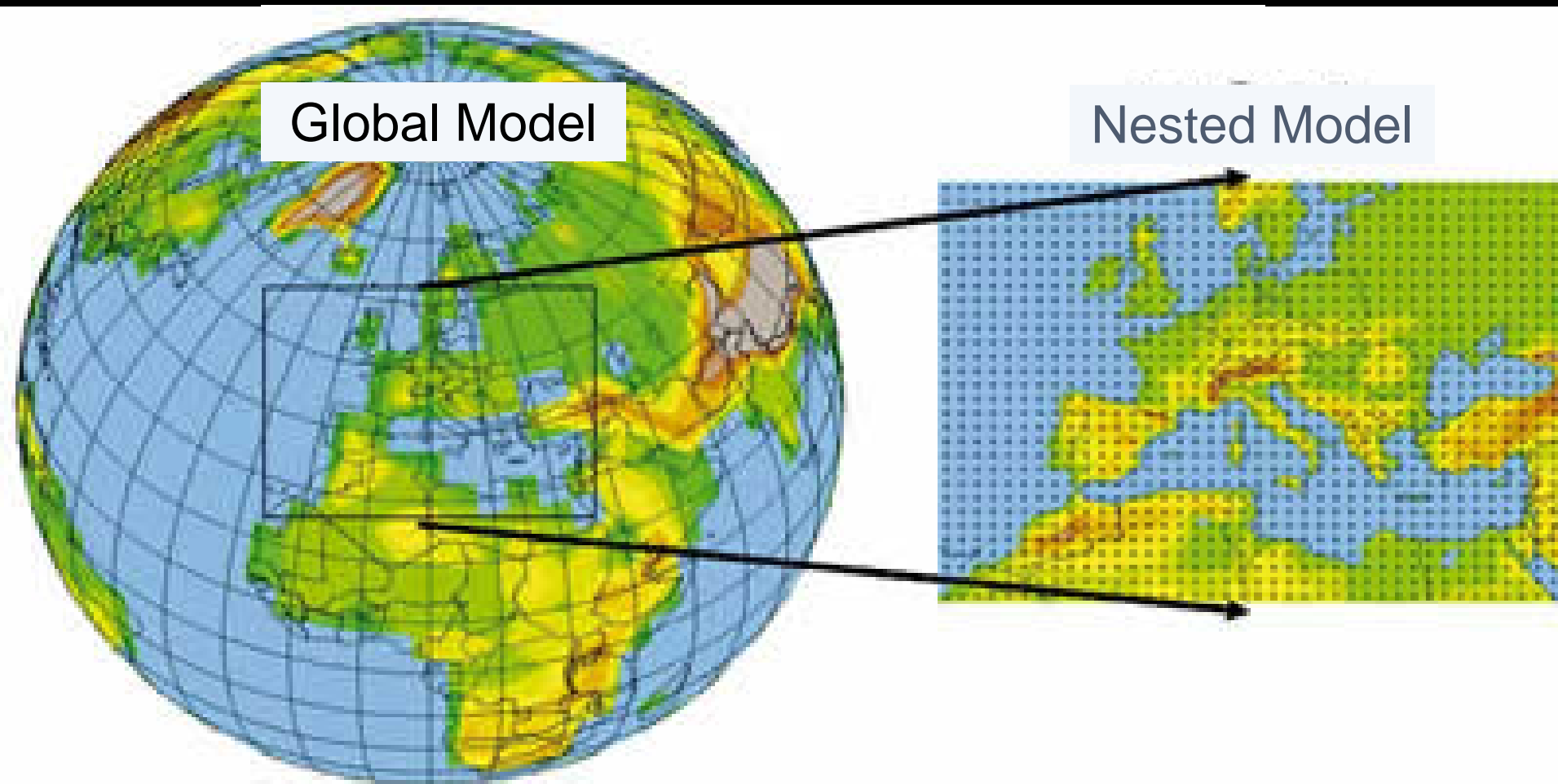
(2) Domain includes US

(3) I know about it.



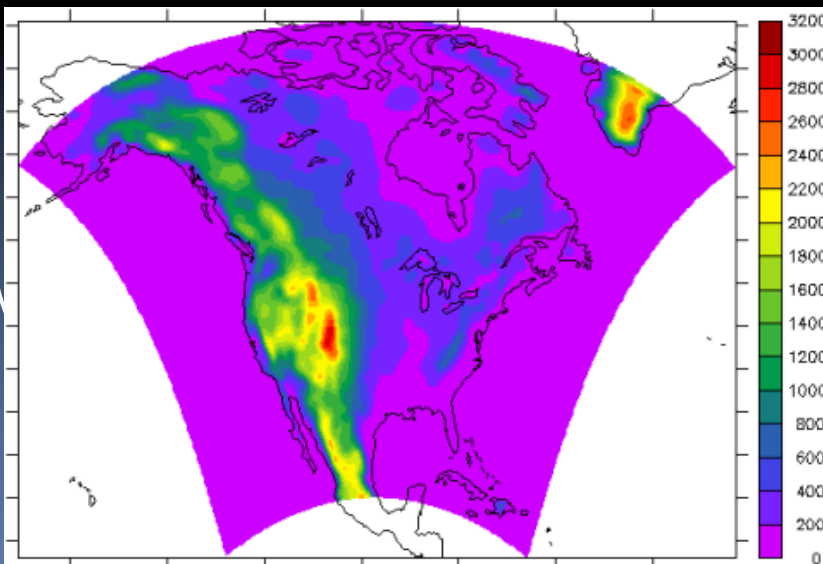
Dynamical Downscaling: Adds detail based on physical laws

Uses a limited-domain climate model that is “nested” within a global model



North American Regional Climate Change Prediction Project (NARCCAP)

- 6 regional models x 4 GCMs, plus 2 high-resolution GCMs
- 50 km resolution 3-hourly output 1979-2000 + 2041-2070
- NARCCAP web site: <http://www.narccap.ucar.edu/>
- much more complete set of variables than statistical methods provide
- Only 4 GCMs, relatively coarse grid spacing, only one scenario (A2)!

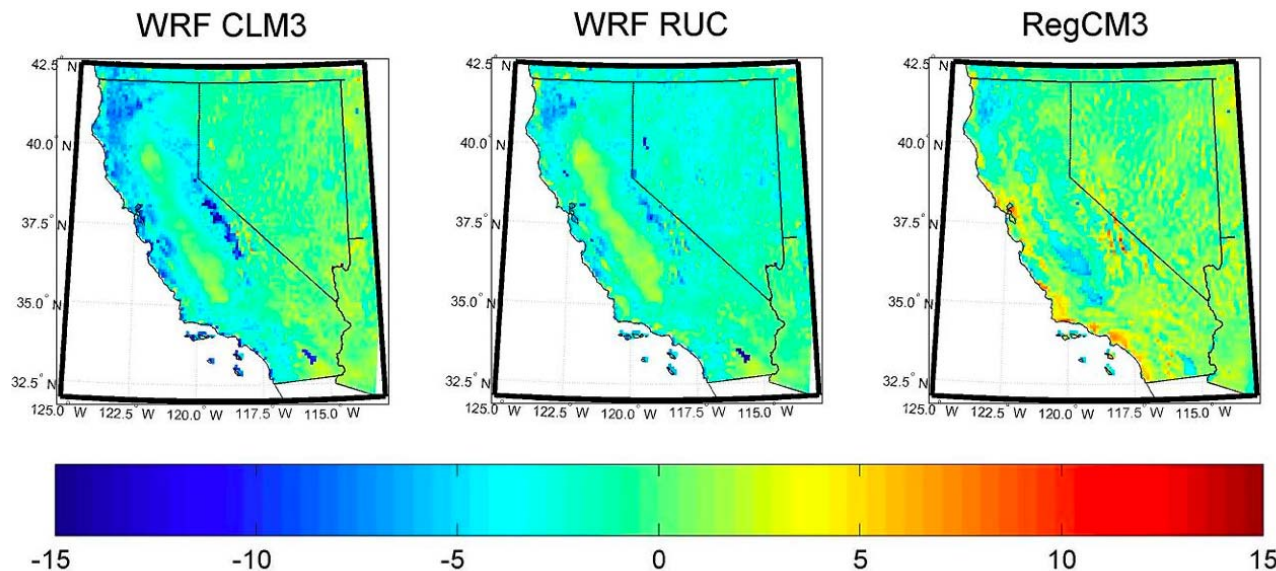


NARCCAP Domain



CEC Climate Projections Project

- California
- 3 dynamical models + 2 statistical methods
- ~10 km resolution
- Phase I complete, Phase II under way
- Results available in a few months.



Errors in
simulations of
summer daytime
temperatures in
3 models



The Coordinated Downscaling Experiment (“CORDEX”)

Organized by World Climate Research Program

The Good News

- A huge effort involving many nations and institutions
- Will produce results for all major land areas, multiple RCPs, GCMs, etc. etc.

The Bad News

- Don’t expect many results soon.
- Target grid spacing is coarse (50 km).

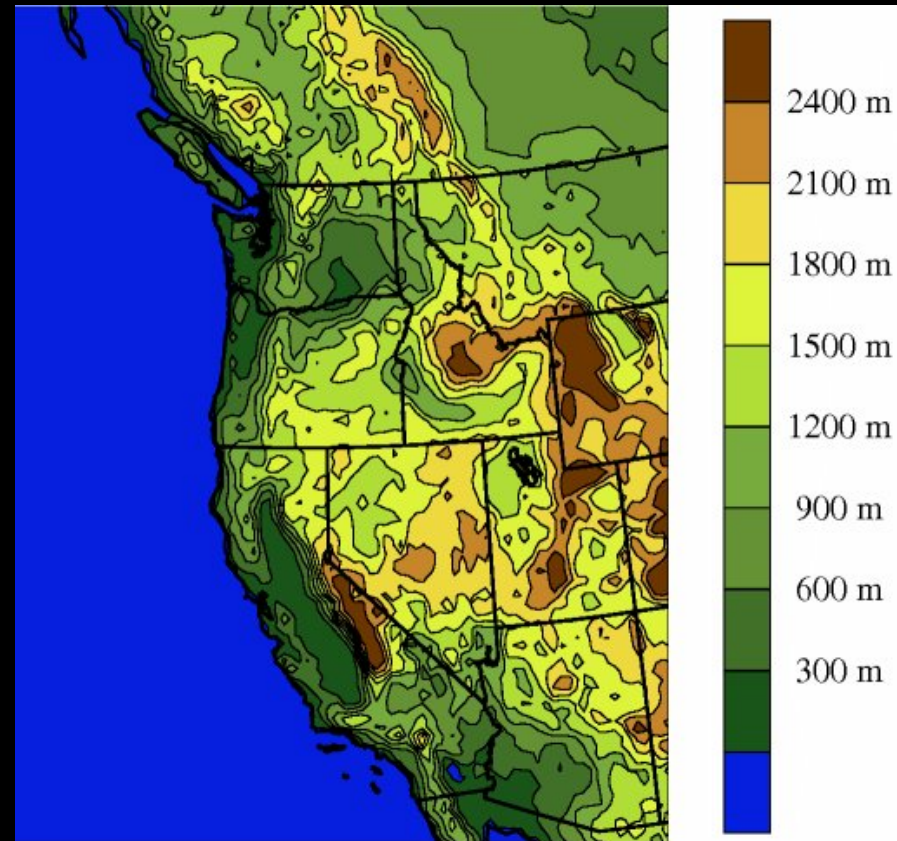
http://wcrp.ipsl.jussieu.fr/RCD_CORDEX.html

<http://www.meteo.unican.es/en/projects/CORDEX>



“Regional climateprediction.net”: a *huge* ensemble of regional climate projections

- Richard Jones,
Phil Mote, *et al.*
- Vary parameter values
in both nested and driving
models.
- Plan to perform thousands
of simulations using citizen
volunteers
- *Very* limited output

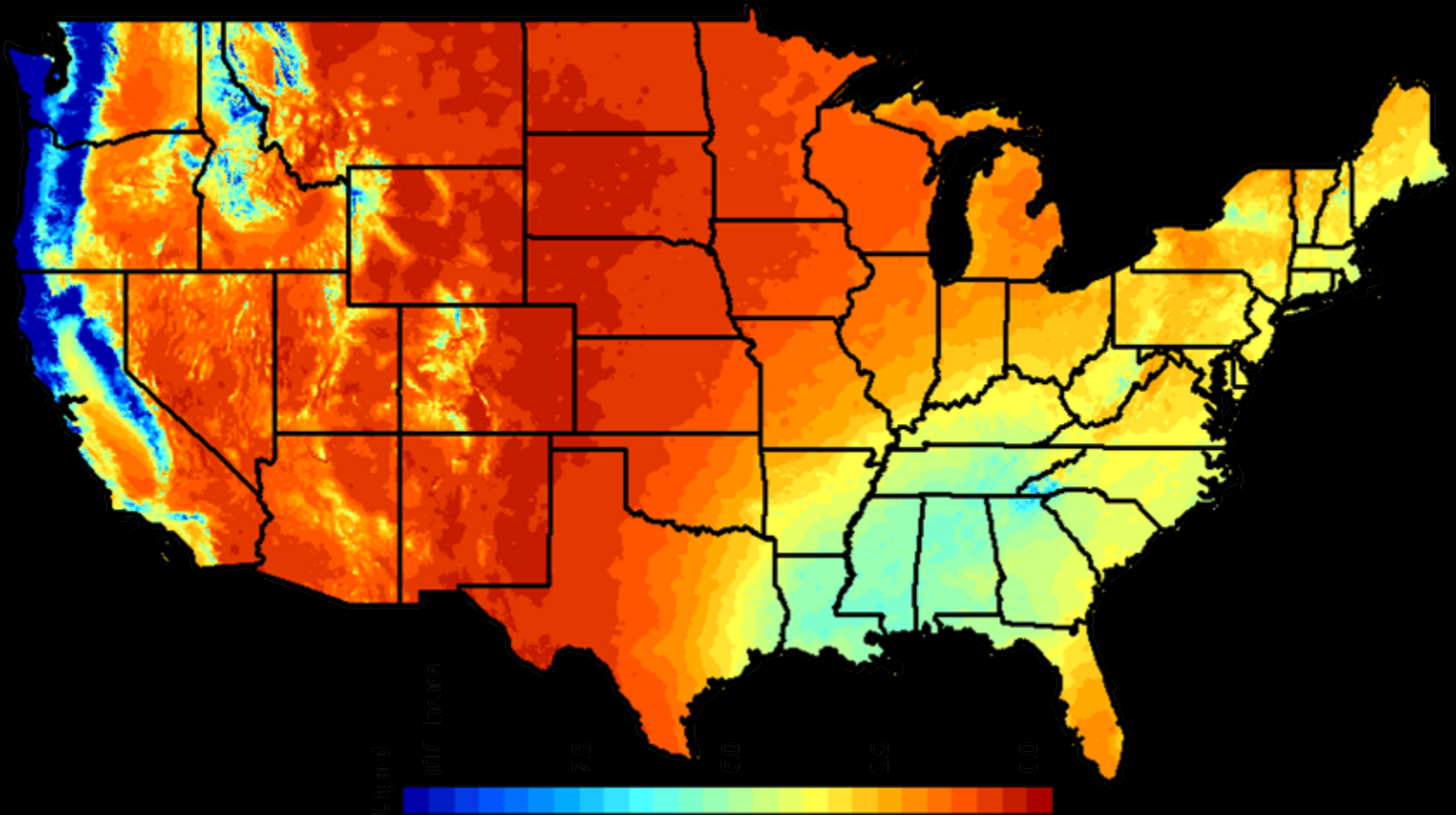


RegCPDN domain

See: Climateprediction.net/content/regional-model


Statistical/Empirical Downscaling

Adds detail based on observations



Statistically downscaled WCRP CMIP 3 climate projections

http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcpInterface.html
(Google “statistically downscaled climate projections”)



Bias Corrected and Downscaled WCRP CMIP3 Climate Projections

This site has been optimized for Internet Explorer (IE) 6., IE 7.*, and
Firefox 2.*.
Requires JavaScript to be enabled.*

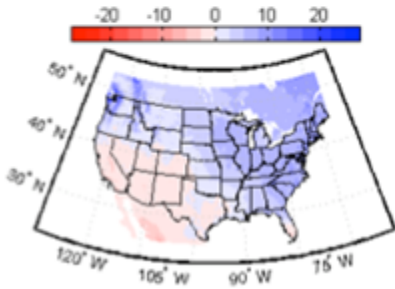
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Announcements (updated January 25, 2010 - Now serving Gridded Observations and intermediate BCSD data products)

Summary

This archive contains fine spatial-resolution translations of 112 contemporary climate projections over the contiguous United States. The original projections are from the [World Climate Research Programme's \(WCRP's\) Coupled Model Intercomparison Project phase 3 \(CMIP3\)](#) multi-model dataset, which was referenced in the Intergovernmental Panel on Climate Change Fourth Assessment Report. Please see the "About" for information on data development, including the methodology to perform climate model bias-correction and

Figure 1: Median projected change in average-annual precipitation (cm/year), 2041-70 versus 1971-2000



Santa Clara U.,f Reclamation, Livermore Lab, Scripps, Climate Central

Statistically downscaled WCRP CMIP 3 ...

Available Now:

- 112 simulations of 1950 – 2100
BCSD downscaling method: 12 km grid
monthly temperature and precipitation
16 GCMs, A2, A1b, B1 emissions scenarios
- Bias-corrected GCM results at 2° x 2° grid spacing
- Gridded observations of temperature and precipitation

Available Soon:

- Results of hydrological simulations based on above (soil moisture, runoff, etc.)

Statistically downscaled WCRP CMIP 3 ...

Available soon:

- 19 simulations of 1961 – 2000, 2046-2065, and 2080-2099
BCCA downscaling method; 12 km grid
Daily temperature (min, max, mean) and precipitation
10 GCMs, A2, A1b, B1 emissions scenarios
(limited by availability/quality of daily GCM output)

This downscaling is complete; will be archived by end of 2010

ecoclim.org

- Very simple downscaling method
- based on “Worldclim” observational data set
- 1 km grid spacing, global domain
- 17 GCMs, 2 scenarios
- T_{\min} , T_{\max} , T_{mean} , Precip
- Cal Academy, UC Merced, Climate Central



Downscaled CMIP5 projections

- Army Corps of Engineers, US Bureau of Reclamation, DOE, Santa Clara Univ., UC San Diego, IPCC WGII, Climate Central.
- New GCM simulations to be used in IPCC AR5
- Results will be distributed through LLNL/PCMDI
(same portal as GCM results)
- US domain results at 12 km, 4 km
 - monthly, daily
 - 2 downscaling methods (BCCA, BCSD)
 - T_{\min} , T_{\max} , T_{mean} , Precip
- Global domain results at 0.5 deg. (daily, monthly)
- About 50 Tbyte total

NASA Earth Exchange



The screenshot shows the NASA Earth Exchange (NEX) website. At the top left is the NASA logo, followed by the NEX logo and the text "NASA Earth Exchange". To the right are links for "Login" and "Register", a search bar, and a "Search" button. Below the header is a navigation bar with four tabs: "HOME", "RESEARCH AREAS", "PROJECTS", and "RESOURCES". The main content area features a large banner with the word "explore" in a large, light blue font. The banner includes several circular images: a landscape, a field of crops, a fire, and a mosquito. A satellite is shown in the foreground, and a person is visible in the background. The word "Share" is written in a large, light blue font. Below the banner is a "LEARN MORE" button. To the right of the banner is a sidebar with a blue background. It contains a link "→ Explore NEX" and three sections: "Research Areas" (Learn about our research goals and associated projects.), "Projects" (See what others in the community are working on. Join or start your own.), and "Resources" (Available data sets, algorithms, and publications FREE to download).

NASA

NEX NASA Earth Exchange

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Research Areas
Learn about our research goals and associated projects.

Projects
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A place to share and use earth science data

NASA Earth Exchange

- Downscaled climate projections
- Derived societal impacts indices, e.g.
 - Drought
 - species ranges
 - wildfire activity
 - contributed by users



I'm almost done.....

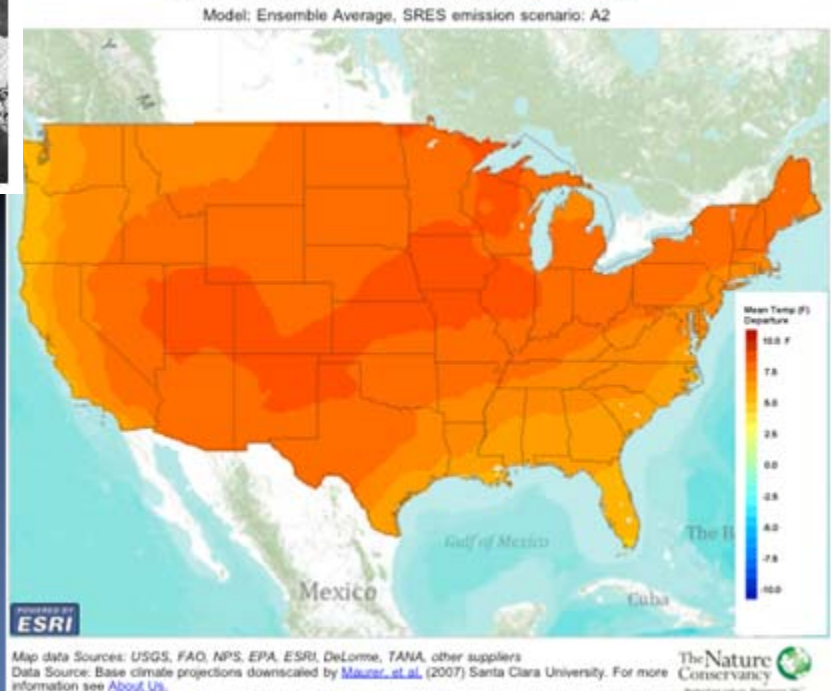


Some limitations of BCSD method



Doesn't capture local feedbacks

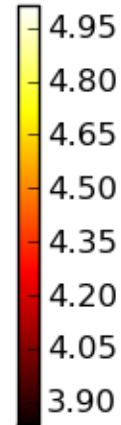
Temperature *changes* by 2080-2099



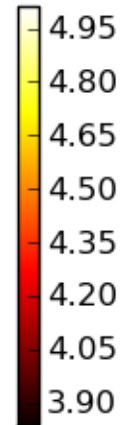
Temperature *changes*
are coarse (GCM scale)

New method may be promising

New method



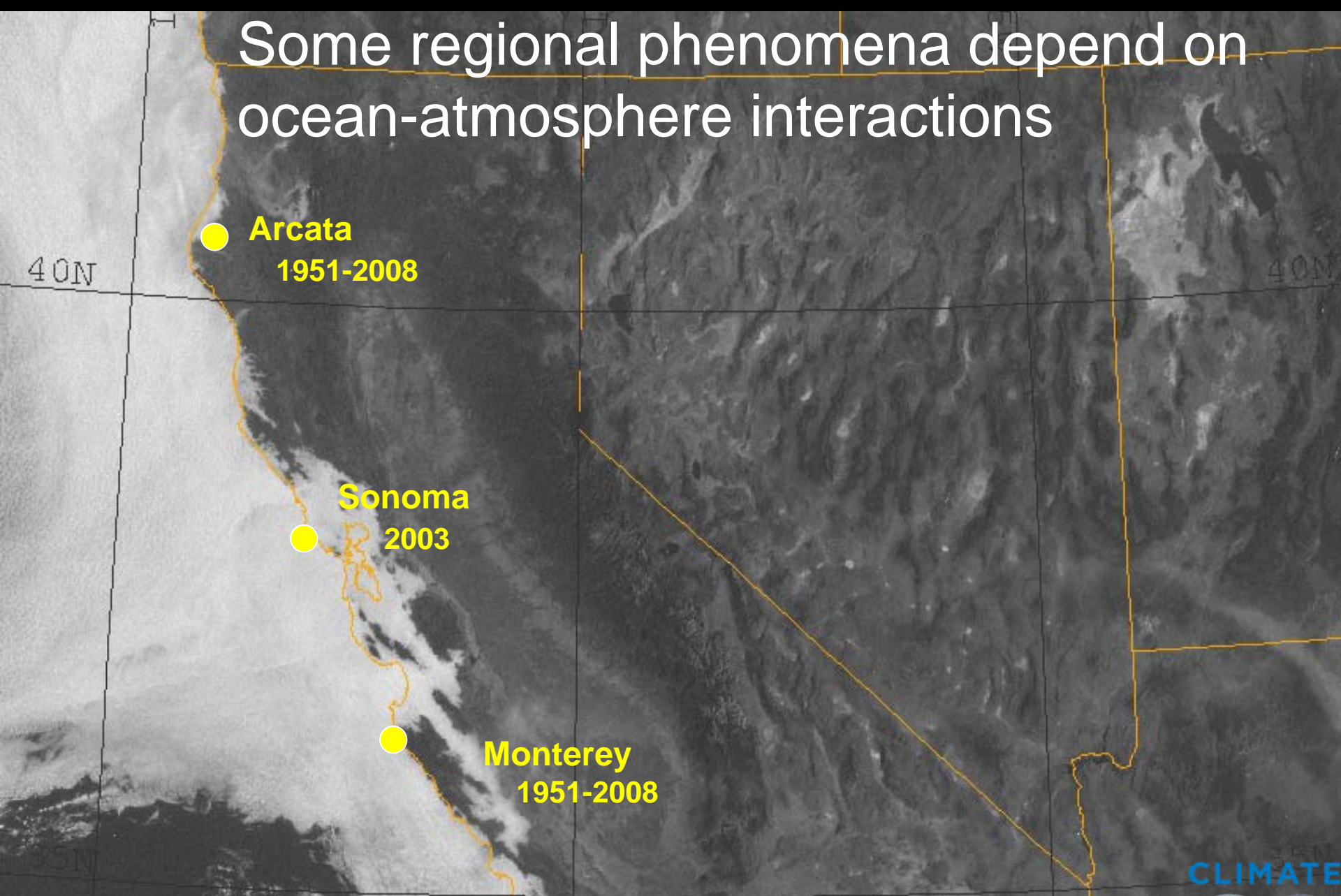
BCSD



Projected monthly temperature changes in regions experiencing the most warming

Source: Kate Marvel, Stanford

Some regional phenomena depend on ocean-atmosphere interactions



Source: Jim Johnstone, UC Berkeley

What's the best data set for me?



Ask: pduffy@climatecentral.org

"That's all Folks!"



Cartoon Songs From

MERRIE MELODIES & LOONEY TUNES